(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 225 037 A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 86308263.2

(22) Date of filing: 23.10.86

(51) Int.Cl.⁴: B 65 B 25/06
B 65 B 5/10, B 65 B 43/42

(30) Priority: 26.10.85 GB 8526449

(43) Date of publication of application:
10.06.87 Bulletin 87/24

(84) Designated Contracting States:
DE FR GB NL

(71) Applicant: WILSON FOODS CORPORATION
4545 North Lincoln Boulevard
Oklahoma City Oklahoma 73104(US)

(72) Inventor: Whitehouse, John Arthur
8 Old Rectory Close Mulbarton
Norwich Norfolk(GB)

(74) Representative: Nash, Keith Wilfrid
KEITH W. NASH & Co. Pearl Assurance House 90-92
Regent Street
Cambridge CB2 1DP(GB)

(54) Improvements In and relating to packaging apparatus.

(57) Apparatus for loading trays with cut product typically meat chops is described, comprising a delivery conveyor (22) onto which are delivered the pieces of cut product (76) in sequence for movement to a delivery station (26), a tray conveyor (32) extending transversely to the delivery conveyor (22) and adapted to deliver in succession each of a plurality of trays (90) to the delivery station to receive cut product, and a product detector (94, 96) at the delivery station to detect the passage of each piece of cut product therethrough. The tray conveyor drive (230) operates in response to the detection of cut pieces by the detector (94, 96) to move the tray conveyor through a small amount sufficient to present the next available region of a tray to the delivery station, to receive the next piece of cut product so as to fill each tray in turn. A transfer conveyor (34) downstream from the delivery station moves the filled trays away from the delivery station.

EP 0 225 037 A2

Title:

Improvements in and relating to packaging apparatus

Field of invention

This invention concerns packaging apparatus and in particular apparatus by which cut pieces of a product can be delivered to tray like supports into which they are to be packed in a desired manner.

Background to the invention

It is known to cut product into pieces ready for packaging particularly in the food industry. Meat and cheese are typical of such products where relatively small pieces are required for the retail outlet whereas the raw material is only available in large pieces at the wholesale level.

Dedicated cutting machines provide a stream of cut pieces which must be packaged and in the case of meat it has become common practice to layer two or three or more pieces of cut meat on a preformed plastics or (foamed plastics) material tray and to then wrap the latter in a clear film material so that the product can be seen and inspected before purchase but is nevertheless kept airtight during storage and display.

Such a process is of particular application in the packaging of meat chops.

It is an object of the present invention to provide apparatus for use in a packaging line adapted to receive a stream of cut meat pieces typically chops and to lay the cut pieces of meat in a particular manner on a tray-like support ready for wrapping.

It is a further object of the invention to provide such apparatus which is capable of operating at relatively high speed so that a large quantity of such cut product can be handled each hour.

It is a further object of the invention to provide apparatus which can handle the output from two product cutting machines so that whilst one cutting apparatus is operating the other can be cleaned and reloaded.

Summary of the invention

According to one aspect of the present invention apparatus for loading trays with cut product comprises:

1. a delivery conveyor onto the input end of which are delivered the cut pieces in sequence so as to lie one after another along the length of the delivery conveyor as it moves to a delivery station,

2. a tray conveyor extending transversely to the delivery conveyor through the delivery station and adapted to deliver in succession a plurality of trays to the delivery station to receive cut product from the delivery conveyor,

3. product sensing means at the delivery station to detect the passage of each cut piece therethrough,

4. drive means for the tray conveyor operable in response to drive signals which are generated in response to the detection of cut pieces by the product sensing means each signal serving to move the tray conveyor through a distance sufficient to present the next available region of the tray to the delivery station, to receive the next piece of cut product until the tray is full, and

5. transfer conveyor means downstream from the delivery station onto which filled trays pass after being filled to move the filled trays away from the delivery station in a continuous manner toward a wrapping station.

Preferably the trays are arranged in abutting end to end

relationship along the tray conveyor.

Where different lengths of shift are required between the delivery of one cut piece and the next, counting means may be provided to determine how many pieces have been loaded per tray and further control means is provided to adjust the distance by which the tray which is being loaded is shifted, by the next drive to arrive.

According to a preferred feature of the invention, where the product is cut pieces of meat, one or more air jets are located at the delivery end of the delivery conveyor and control signals therefor are derived from the product sensing means to generate a controlled puff of air a predetermined period of time after the detection of a cut piece of meat at the output of the delivery conveyor, the timing being such as to cause the cut piece of meat to be tilted by the puff of air during its flight from the end of the delivery conveyor onto the tray on the tray conveyor, to thereby cause the product to adopt an inclined position in the tray.

Preferably tray sensing means is provided, in association with the tray conveyor, to detect the presence and absence of trays at the delivery station, and control means is provided responsive to signals from the tray sensing means to inhibit the operation of the delivery conveyor in the event that no tray is detected at the delivery station.

Conveniently the tray conveyor comprises a pair of guide rails along which the trays can slide and a driving conveyor having driving dogs situated at invervals therealong running between the rails. In this way each tray is engaged by one of the driving dogs and is pushed

in a forward direction along the conveyor path into and through the delivery station.

Preferably the guide rails are adjustable both in height and relative spacing so as to enable the apparatus to be tailored to any particular tray size within a range of sizes.

Since the motion of each tray through the delivery station is made up of a series of steps each of which involves the acceleration of the tray from rest followed almost immediately by a deceleration as it arrives at its next required position, friction braking means is preferably provided at the delivery station to arrest the forward movement of each tray as it passes therethrough and prevent overshoot of each tray following each stepwise forward movement thereof. The friction braking means typically comprises spring loaded fingers which engage one or both sides or edge regions of the tray.

Preferably guide means is provided upstream of the output end of the delivery conveyor for positioning the cut product on the delivery conveyor to a precise position across the outlet thereof so that as each piece of cut product arrives at the output of the delivery conveyor, at least one edge thereof is positioned precisely across the width of the delivery conveyor and therefore in turn along the length of the tray conveyor, thereby enabling the position of the cut product as it leaves the delivery conveyor to be precisely known.

Upstream from the delivery station, the trays are conveniently stacked one above the other in a column above the tray conveyor and means is provided for removing the

trays in turn from the bottom of the stack and depositing them on the tray conveyor.

Where the latter as indicated above comprises a pair of rails on which the trays can slide in conjunction with a driving conveyor having driving dogs which move between the rails to effect movement of the trays along the rails, the mechanism for removing the trays from the bottom of the stack conveniently locates the bottom-most tray on the rails in a position in which it can be engaged by the next driving dog, to arrive after which the tray will be pushed forwardly relative to the rest of the stack, towards the delivery station.

Conveniently the driving dogs are mounted on an endless belt or chain which extends parallel to the rails forming the remainder of the tray conveyor.

Where the apparatus is designed to operate with different sizes of tray, the latter are preferably coded typically along an edge region thereof and decoding means is provided at a position along the tray conveyor for determining the particular tray size and generating control signals indicative thereof.

To this end the drive means for the tray conveyor conveniently operates in a series of incremental steps and either the step size or the number of incremental steps making up each transfer movement of the tray conveyor is controllable in response to the signals from the tray decoding means.

The invention also provides a method of cutting meat into pieces and loading same into trays comprising the steps

of:-

1) cutting the meat into relatively small similarly shaped pieces;

2) delivering the pieces in succession by means of a delivery conveyor to a delivery station for loading into a tray located thereat;

3) incrementally moving the tray relative to the delivery station after each cut piece of meat has been delivered thereto;

4) sensing the arrival of each piece of meat at the delivery station and generating and applying a puff of air towards the cut of meat as the latter is in free flight between the outlet of the delivery conveyor and the tray, to tilt each piece of meat so as to cause the meat to be inclined as it comes to rest in the tray, to enable the pieces of meat to be shingled as it is laid in the tray.

In a preferred embodiment there are two cutters and meat from one cutter and then the other is delivered to the delivery conveyor.

According to another aspect of the invention in a method of loading pieces of meat into trays using the apparatus and methods as aforesaid, improved performance and reliability is obtained by controlling the temperature of the meat portions so that the meat is of appropriate texture to land on the trays with minimal bounce.

Where pork chops are involved a preferred temperature has been found to be in the range 26 to 30 degrees Fahrenheit preferably 28 degrees Fahrenheit.

The invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic plan view of a packaging line incorporating apparatus embodying the invention.

Figure 2 is a general view in the direction the arrow A of part of the apparatus shown in Figure 1.

Figure 3 is a perspective view from above of the outlet end of one of the delivery conveyors shown in Figure 2.

Figure 4 is a perspective view of the lower end of the tray stack.

Figure 5 is another perspective view of the tray stack, this time shown empty,

Figure 6 is an end view of the lower end of the tray stack support and shows the mechanism by which trays are removed from the bottom of the stack and loaded onto the tray conveyor,

Figures 7A and 7B are diagrammatic side and top views of the delivery end of the tray conveyor,

Figure 8 is a top view of a tray loaded with 4 meat chops after passing through the loading station shown in Figure 3,

Figure 9 is a side view of the tray of Figure 8 with the nearer side of the tray removed to enable the lay of the chops to be seen,

Figure 10 is a perspective view of part of the main conveyor onto which the filled tray is delivered from the transfer conveyor of Figure 7A,

Figure 11 is a perspective view of a buffer conveyor and gate to which the filled trays are delivered by the main conveyance of Figure 10, and

Figure 12 is a perspective view of the gate mechanism of Figure 11 from the opposite side.

Figure 13 is a schematic block circuit diagram of part of the control system associated with the apparatus of Figures 1 to 12.

Detailed Description of Drawings

Figure 1 is a plan view of the overall packaging line. The apparatus is designed to cut large pieces of meat into chops or similar slices and two band saw automatic cutting machines shown at 10 and 12. Each includes a carousel 14 and 16 respectively on which can be mounted up to 4 pieces of meat from which chops can be cut as the carousel is rotated past a band saw. The cut pieces leave the cutting station in the direction of the arrow 18 in the case of cutter 10 and 20 in the case of cutter 12.

Conveyors generally designated 22 and 24 deliver the cut pieces to two loading stations generally designated 26 and 28 respectively which will be described in greater detail in relation to later figures.

Trays are stacked at 30 and are removed one by one and positioned on a tray conveyor generally designated 32 which incrementally moves the trays through the loading stations 26 and 28 to a transfer conveyor 34 and from thence to a main delivery conveyor 36, part of which serves as a buffer conveyor at 38 the output from which is controlled by the operation of a gate 40.

Two further meat cutting machines at 42 and 44 are also shown with associated conveyors 46 and 48 for supplying a second tray conveyor 50 having trays supplied from a second stack 52 for delivering filled trays to a second buffer conveyor 54 whose output is controlled by a second gate 56. The second pair of meat cutting machines 42 and 44 are optional and simply indicate how throughput can be

increased by parallel operation.

In order to accommodate output from two gates 40 and 56, a two into one conveying station 58 is provided for supplying a single line of filled trays to a wrapping apparatus 59 via a conveyor 61.

In its simplest form, the apparatus would comprise a single cutting machine such as 10, associated conveyor 22, and related tray conveyor 32 and tray stack and delivery station 30. The second cutting machine 12 simply allows a more efficient operation in that whilst the first cutter is operating, the second cutter can be reloaded and cleaned ready to be put into action as soon as the meat in the operating machine is exhausted.

Figure 2 is a perspective view of the apparatus in the direction of arrow A in Figure 1. Thus the two meat cutting machines 10 and 12 can be seen in the background with their associated conveyors 22 and 24 feeding the tray conveyor which will be described in more detail later and which is supported by a framework 60 which extends transversely to the two feed conveyors 22 and 24.

An upright tray magazine is shown at 62 within which are stacked trays 64 one above the other. Each of the trays is generally square or rectangular in plan view, includes a depressed central region into which product can be laid and has a peripheral lip. The form of each tray can best be seen from Figures 8 and 9 to which reference will be made later.

The magazine 62 can be lifted clear from a support 66 to allow a fresh magazine to be fitted or simply for the

magazine to be filled with trays.

A mechanism which will be described later removes each tray in turn from the bottom of the stack and each such tray is engaged on a conveyor having upstanding driving dogs, one of which is shown at 68 which engage the rear edges of the trays and move them in a direction from beneath the magazine 62 towards the loading stations at the delivery ends of the conveyors 24 and 22.

The path of the conveyor (not shown) containing the dogs 68, is such that the latter rise up at the right hand end of the framework 60, move across the framework 60 from right to left in Figure 2 and descend in a downward direction at the left hand end of the framework 60 in Figure 2. At that point the trays are delivered to a further conveyor as will be hereinafter described.

Controls, drives and power supplies for the conveyors, tray magazine and for controlling the delivery of trays from the conveyors 22 and 24 onto the tray conveyor 32 are contained within units 70, 72 and 74 respectively.

Delivery Station

Figure 3 of the drawings illustrates to a larger scale the outlet end of the delivery conveyor 22 of Figures 1 and 2 and the interaction of this with the tray conveyor generally designated 32. This interaction forms the delivery station or loading station where cut pieces of product such as meat chops or the like are loaded into a tray.

One such cut piece is shown at 76 and in practice will be

preceded and followed by other similar cut pieces all travelling towards the tray conveyor 32.

To one side of the delivery conveyor 22 is an alignment guide 78 made up of a metal leaf spring anchored at 80 and adjustable in position at its downstream end by means of a screwed rod 82 and block 84. Positioning of the leaf 78 determines the precise position of the cut pieces across the width of the delivery conveyor 22 as they approach the exit end or outlet therof.

Where the conveyor belt 86 of the delivery conveyor 22 passes around the end roller 88, the cut pieces 76 will fall in free flight from the end of conveyor 22 onto a waiting tray, one of which is shown in dotted outline at 90.

The tray 90 is one of a number of such trays lying along the tray conveyor 32 and which are indexed in a forward direction denoted by arrow B in Figure 3 by means of the tray conveyor drive dogs of which one is shown at 92. These are attached to an endless chain (not visible in Figure 3) and the latter is driven in a series of incremental movements so as to shunt the line of trays past the loading station. As each tray is positioned in front of the loading station formed by the outlet of the conveyor 22, the cut pieces leave the conveyor belt 86 and after free flight land on the tray below.

Adjacent the exit of the conveyor belt 86 are located two sensors 94 and 96 with an optical link between them so that as a piece of cut product such as 76 arrives at the exit end of the conveyor belt 86 so the optical link is interrupted causing an electrical signal to be generated

to serve as a control signal.

Further information is obtained when the optical link is re-established after the passage of a piece of cut material allowing a further electrical signal to be generated indicating that one piece has passed and another can now be expected.

Adjacent the exit end is located an air pipe 98 having an outlet nozzle 100 which pipe is adjustable so as to direct an airstream from the nozzle 100 toward the flight path of cut pieces such as 76 as they leave the conveyor. By appropriate adjustment of the nozzle and appropriate adjustment of the pressure and volume and duration of each air pulse leaving the nozzle, so a cut piece such as 76 leaving the conveyor 86, can be deflected and tilted simultaneously so as to land in the tray in a tilted condition instead of lying flat on the bottom of the tray. This is of great advantage where chops and similar types of meat product are involved since it allows the pieces to be layered in the pack to present the edge regions of the chops or other pieces of meat one overlying the other.

Opposite the delivery end of the conveyor belt 86 are located two spring fingers 102 and 104 which are mounted on pivot blocks 106, 108 and are sprung in a direction so as to cause the fingers to protrude into the path of the trays.

The springing is very light and as each tray is pushed into the position aligned with the end of the conveyor belt 86, so the two fingers 102 and 104 are pushed out of the way by the side wall of the tray. However, there is just sufficient friction between the fingers and the tray

edge to restrain the tray so that the latter is prevented from overshooting as it is pushed in a series of incremental steps past the delivery end of the conveyor belt 86 by the movement of a dog 92.

In addition to the fingers 102 and 104, a tray sensor 110 is located immediately below the path of the trays which is itself engaged by the underside of each tray as the latter is moved into position. Control signals from the sensor are used to instigate the operation of the cutting machine and delivery conveyor drive.

In this connection the signals from the sensor link 94, 96 serve to indicate that cut pieces have now arrived at the delivery end of the conveyor 22 and each piece can be counted as it passes between 94 and 96. Overall control of the apparatus is achieved by means of a microcomputer controlled device having a memory into which information is stored concerning inter alia a number of pieces to be laid in each tray and the distance through which tray must be indexed after it has arrived at the loading station so as to accommodate the desired number of cut pieces in a particular configuration within the tray. The signal from the sensor 110 thus initiates the process, the signal from the sensor link 94, 96 dictates the number of pieces which are laid in the tray and in the event that no tray supplants the first after the latter has been moved out of the delivery station region, the appropriate signal from the sensor 110 temporarily halts the cutting and delivery of further pieces until the fault has been remedied.

The timing of the jet of air from the nozzle 100 is achieved using as a trigger the signal from the link 94, 96.

As is best seen from Figures 3 and 4, the sides of the tray conveyor are made up of pairs of upper and lower guide rails 112 and 114 on one side and 116 and 118 on the other side.

The conveyor bed is stationary and is formed from a pair of elongate plates 120 and 122 separated by a groove 124 through which the dogs 92 extend and along which they can pass.

Tray magazine

The tray magazine 62 as shown in Figure 2, is shown in greater detail in Figures 4, 5 and 6.

Referring particularly to Figure 5, the magazine is constructed from a number of upright rods some of which are denoted by reference numeral 126 in Figure 5, forming a cage and bounded at the top and bottom and midway by means of bands 128, 130 and 132 respectively.

The lower band includes pairs of fixing knobs such as 134 and 136 (see Figure 6) on opposite sides by which the magazine can be secured to two upright flanges 138 and 140 secured to and extending from the support 60.

Two tray support grants extend across the underside of the band 132 on which the lips of the lowermost tray rest and the precise spacing between the rods is adjusted by means of cams 140 and 142 acting on pivoted levers 144, 146.

Relative outward movement of the rods reduces the amount of overlap between the tray and the rods thereby making it

easier to remove the lowermost tray whilst decreasing the spacing, increases the resistance to movement of the lowermost tray and removal thereof.

Actual removal of a tray from the lowest position in the stack is achieved by means of 4 suction cups of which 2 are visible in Figure 5 and are designated 148 and 150. The suction cups are formed at the upper ends of 4 piston rods of which two are shown at 152 and 154 in Figure 6. Upward displacement of the rods 152, 154 etc raises the suction cups 148, 150 etc into contact with the underside of the lowermost tray as shown in dotted outline in Figure 6. Subsequent withdrawal of the piston rods causes the tray impaled on the 4 suction cups to be dragged in a downward direction and by virtue of the deformability of the material forming the tray, the latter can be pulled downwardly past the rods 156, 158.

Figure 6 shows by way of dotted outline the lowermost tray 160 in the stack of trays contained in the magazine and in solid outline below the last tray to have been removed at 162.

Also visible in Figure 6 are the two pairs of guide rails 112 and 114 and 116 and 118. Adjustment of the relative spacing between the two pairs of guide rails can be effected by adjusting knob 164. Rotation so as to move the knob to the right in Figure 6 displaces the rails 116 and 118 in one direction whilst rotating the knob in the opposite sense produces reverse movement of the arm bearing the rails 116, 118.

Similar adjusters are provided at 166 and 168 (see Figure 5) and by appropriate adjustment so the rails 116 and 118

can be twisted from the position shown in Figure 6 where the tray will just rest on the upper rails 116 and 112, to the reverse of that shown in Figure 6 in which the tray can slip between the two upper rails and rest on the two lower rails 114 and 118 and be held captive in an upward sense by means of the two upper rails 116 and 112.

The transition from the position shown in Figure 6 to the position shown in Figure 6 to the position in which the rim of the tray is held captive between the pairs of rails on opposite sides of the track of the tray conveyor is effected as the tray is moved from below the stack in the magazine 62 towards the loading station.

Replacement of the magazine 62 with a freshly stacked magazine or simply to facilitate servicing or removal of jammed trays, is simply effected by undoing knobs 134 and 136 and lifting the magazine bodily away from the side cheeks 138 and 140 (see Figure 6).

Tray Conveyor

Figures 7A and 7B illustrate the tray conveyor and also visible is the transfer conveyor onto which the filled tray is passed.

The tray conveyor is an endless chain 170 on which are mounted the driving dogs such as 92. The chain passes around idlers such 172 and driven wheels 174.

The drive for the chain is derived from a stepper motor (not shown) which willaccurately index the chain through predetermined distances in response to an appropriate number of electrical pulses supplied to the motor.

In this way the trays can be indexed along the path of the tray conveyor by controlled distances so as to accurately position the trays relative to the discharge conveyor such as 22 and once in position can also be indexed accurately to receive different pieces of the cut product such as 76 at predetermined positions along the length of each tray thereby ensuring that the product is evenly distributed along the length of the tray and can be shingled, that is made to overlay one piece on another, preferably with edge regions shown uniformly.

Beyond the tray conveyor is located a transfer conveyor best seen in Figure 7B. This is made up of a number of endless belts of which one is designated 176. There are 6 belts in all arranged in two groups of three on opposite sides of the central chain 170 of the tray conveyor.

Rollers such as 178 and 180 are provided at opposite ends of the transfer conveyor path and a constant speed drive (shown in Figure 7A) at 182 drives the endless belts such as 176. Idlers 184 and 186 take up the slack and provide for the change of direction of the belts.

As shown in Figures 7A and 7B in dotted outline, a tray 90 will be pushed by the driving dogs 92 off the platform of the tray conveyor onto the endless belts such as 176 which since they are moving in the direction of the arrow C in Figure 7A, will cause the tray 90 to be transferred to the left in Figure 7A.

A take-off conveyor 36 (see Figure 1) picks up the trays from the transfer conveyor 34 and conveys the now filled trays towards a buffer conveyor 38 and the remainder of

the wrapping apparatus.

Take-off Conveyor

The take-off or main conveyor is shown in part in Figure 10.

Positioned over the surface of the moving section of the conveyor (188) are located two rails 190 and 192 which are adjustable in position by slackening off the knobs 194 and 196 and sliding the arms 198 and 200 through the blocks 202 and 214 respectively to the desired positions. The knobs 194 and 196 can then be retightened.

The main or take-off conveyor serves to convey the filled trays to a buffer conveyor which is made up of a series of rotatable but non-driven rollers on which the trays will queue and shunt towards the outlet as more trays are added from the take-off conveyor 188.

Buffer Conveyor

This item 38 is shown in Figures 11 and 12. The filled trays arrive from the main conveyor 36 and are eventually halted in their forward movement over the bed of freely rotatable rollers206 by means of a gate 208 which is raisable by means of a pneumatic ram 210.

Operation of the gate is controlled by means of the central control system for the overall apparatus and the gate serves to release trays from the buffer in response to the signals from the central control.

The latter is fed with signals from various sensors which

are shown at 212, 214, 216 and 218. The signals from the various sensors indicate the arrival of a tray at the gate (sensor 212), the arrival of a sensor just in advance of the gate (sensor 214) and where signals are simultaneously received from sensors 216 and 218, the fact that numerous trays are now backing up on the buffer conveyor indicating that the supply of trays to the buffer conveyor is exceeding the rate at which they are being released by the gate.

Beyond the gate 208 are located driven rollers 220 and a further transfer conveyor similar to the transfer conveyor 34 is provided beyond the driven rollers at 222.

System operation

Figure 13 shows the control system for part of the apparatus of Figures 1 to 12. The heat of the system is a central, processor controlled, control unit 224 the operation of which will become evident from the following description.

On pressing ON-push button 226 CPU 224 sends a signal to a tray de-stacker 228 to remove a tray from the stack 64 (Figure 2) and initiate operation of tray conveyor drive 230. Passage of a tray past the decoder 232 produces a control signal for CPU 224 to indicate the size of the tray in use and using a hook-up table or other device the CPU 224 generates appropriate control signals for the tray conveyor drive to enable the correct step size movement to be achieved as each tray passes through the delivery station 26.

At the same time the cutter drive 234 and delivery

conveyor drive 236 are energised and pieces of cut product are delivered to the input end of the delivery conveyor 22. If for any reason product fails to leave the exit end of the conveyor 22, the back-up of product on the conveyor 22 is sensed by a product sensor 238 causing CPU 224 to temporarily arrest drives 234 and 236.

Assuming delivery conveyor 22 is functioningg correctly, cut pieces pass between 94, 96 and electrical pulses are supplied to the CPU 224 to indicate the arrival and passage of cut product pieces to the waiting tray. To this end a power supply 240 supplies current for the light source 94.

A counter 242 (which may form part of the CPU 224) accumulates electrical pulses corresponding to the passage of cut product pieces and provides an overflow signal after present members of pieces have been counted - the counter being reset after each present number has been counted.

CPU 224 is arranged to produce a small increment of travel of the tray at the delivery station for each pulse counted until the overflow signal is generated, whereupon the tray conveyor drive 230 is caused to operate at a higher speed and/or for a longer period of time, so as to shift the tray well clear of the delivery station 26 and replace it with another empty tray.

If at any time the apparatus must be stopped, the push button switch 224 can be pressed, to supply a further signal to the CPU 224, which in response thereto is arranged to halt all drives immediately.

CPU 224 also provides control signals at the correct point in time to a valve 246 for releasing air from a reservoir or pump 248 to the air nozzle 98 (see Figure 3).

General

Where a second delivery conveyor such as 24 is provided adjacent the same tray conveyor, a second tray sensor similar to sensor 110 is provided within the tray conveyor opposite the end of the other discharge conveyor and control signals for the tray conveyor from the central control unit take account of the fact that trays are being filled at both locations and the control signals for the tray conveyor are arranged to accelerate the latter in the event that a tray has been filled by a first discharge conveyor 24 through the second loading station from the discharge conveyor 22 so that the latter makes no attempt to discharge cut pieces onto a filled tray but is always presented with an empty tray.

Where a second line is provided also fed from one or two cutting machines and discharge conveyors such as 42, 44, 46 and 48 as described with reference to Figure 1, it is merely necessary to ensure that the outputs from the two buffer conveyors 38 and 54 are themselves synchronised and phased so that the output from one line is mixed with the output from the other line to provide a single line of filled trays ready for wrapping.

Further details of the air deflection nozzle and controls therefor are contained in my copending application filed concurrently herewith and entitled Improvements in and relating to article handling apparatus (ref C190/W).

Claims

1. Apparatus for loading trays with cut product characterised by:

(a) a delivery convveyor (22) onto the input end of which are delivered the pieces of cut product (76) in sequence so as to lie one after another along the length of the delivery conveyor as it moves to a delivery station (26);

(b) a tray conveyor (32) extending transversely to the delivery conveyor (22) through the delivery station and adapted to deliver in succession a plurality of trays (90) to the delivery station to receive cut product from the delivery conveyor;

(c) product sensing means (94, 96) at the delivery station to detect the passage of each piece of cut product therethrough;

(d) drive means (230) for the tray conveyor operable in response to drive signals which are generated in response to the detection of cut pieces by the product sensing means (94,96), each signal serving to move the tray conveyor through a distance sufficient to present the next available region of a tray to the delivery station, to

receive the next piece of cut product so as to fill each tray in turn; and

(e) transfer conveyor means (34) downstream from the delivery station onto which filled trays pass after being filled to move the filled trays away from the delivery station.

2. Apparatus according to claim 1 further characterised by wrapping apparatus (61) to which the filled trays are moved by further conveyors (36, 38, 58, 61).

3. Apparatus according to claim 1 further characterised by counting means (242) to determine how many cut product pieces have been loaded per tray, and control means (224) is provided to adjust the distance by which each tray which is being loaded is shifted by the next drive signal to arrive.

4. Apparatus according to claim 1 further characterised by one or more air jets (98, 100) located at the delivery end of the delivery conveyor, and signal generating means associated with the product sensing means for generating control signals to generate a controlled puff of air a predetermined period of time after the detection of each piece of cut product is detected at the output of the delivery conveyor, and wherein the timing is such as to cause the piece of cut product to be tilted by the puff of air during its flight from the end of the delivery conveyor onto a tray on the tray conveyor, to thereby cause the product to adopt an inclined position in the tray.

5. Apparatus according to claim 1 characterised in that

the tray conveyor comprises a pair of guide rails (114, 118) along which the trays can slide and a driving conveyor having driving dogs (92) situated at intervals therealong running between the rails, whereby each tray on the rails is engaged by one of the driving dogs and is pushed in a forward direction along the conveyor path into and through the delivery station.

6. Apparatus according to claim 1 characterised by friction braking means (102, 104) at least at the delivery station to arrest the forward movement of a tray as it passes therethrough and prevent overshoot of each tray following each forward movement thereof.

7. Apparatus according to claim 1 characterised by guide means (78) upstream of the output end of the delivery conveyor for positioning the piece of cut product on the delivery conveyor to a precise position across the outlet thereof so that as each piece of cut product arrives at the output of the delivery conveyor, at least one edge thereof is positioned precisely across the width of the delivery conveyor and therefore in turn along the length of the tray conveyor.

8. Apparatus according to claim 1 characterised in that the source of trays is located upstream from the delivery station and the trays are stacked therein one above the other in a column above the tray conveyor and suction means (152, 154) is provided for removing the trays in turn from the bottom of the stack and depositing them on the tray conveyor.

9. Apparatus according to claim 1 characterised by decoding means (232) at a position along the tray conveyor for determining which one of a range of tray size is being

employed and generating control signals indicative thereof.

10. A method of cutting meat into pieces and loading same into trays comprising the steps of

(a) cutting the meat into relatively small similarly shaped pieces;

(b) delivering the pieces in succession by means of a delivery conveyor to a delivery station for loading into a tray located thereat;

(c) incrementally moving the tray relative to the delivery station after each cut piece of meat has been delivered thereto;

(d) sensing the arrival of each piece of meat at the delivery station and generating and applying a puff of air towards the cut piece of meat as the latter is in free flight between the outlet of the delivery conveyor and the tray, to tilt each piece of meat so as to cause the meat to be inclined as it comes to rest in the tray, to enable the pieces of meat to be shingled as it is laid in the tray.

11. A method according to claim 10 wherein the temperature of the meat is in the range 26° to 30° Fahrenheit.

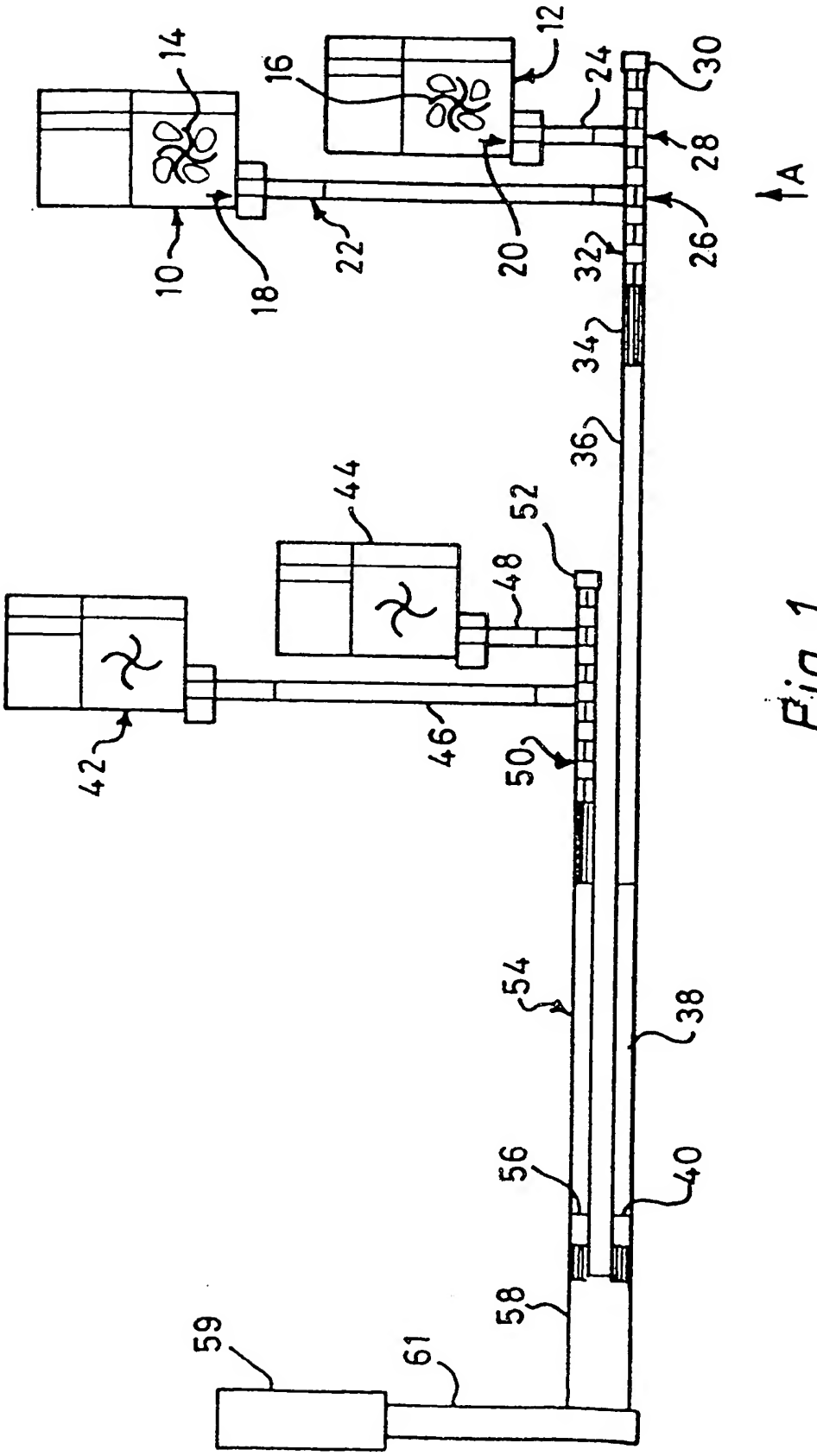
14
16
12
24
30
28
A
10
18
22
20
32
26
34
36
44
52
48
42
46
50
54
38
56
40
58
59
61

Fig. 1

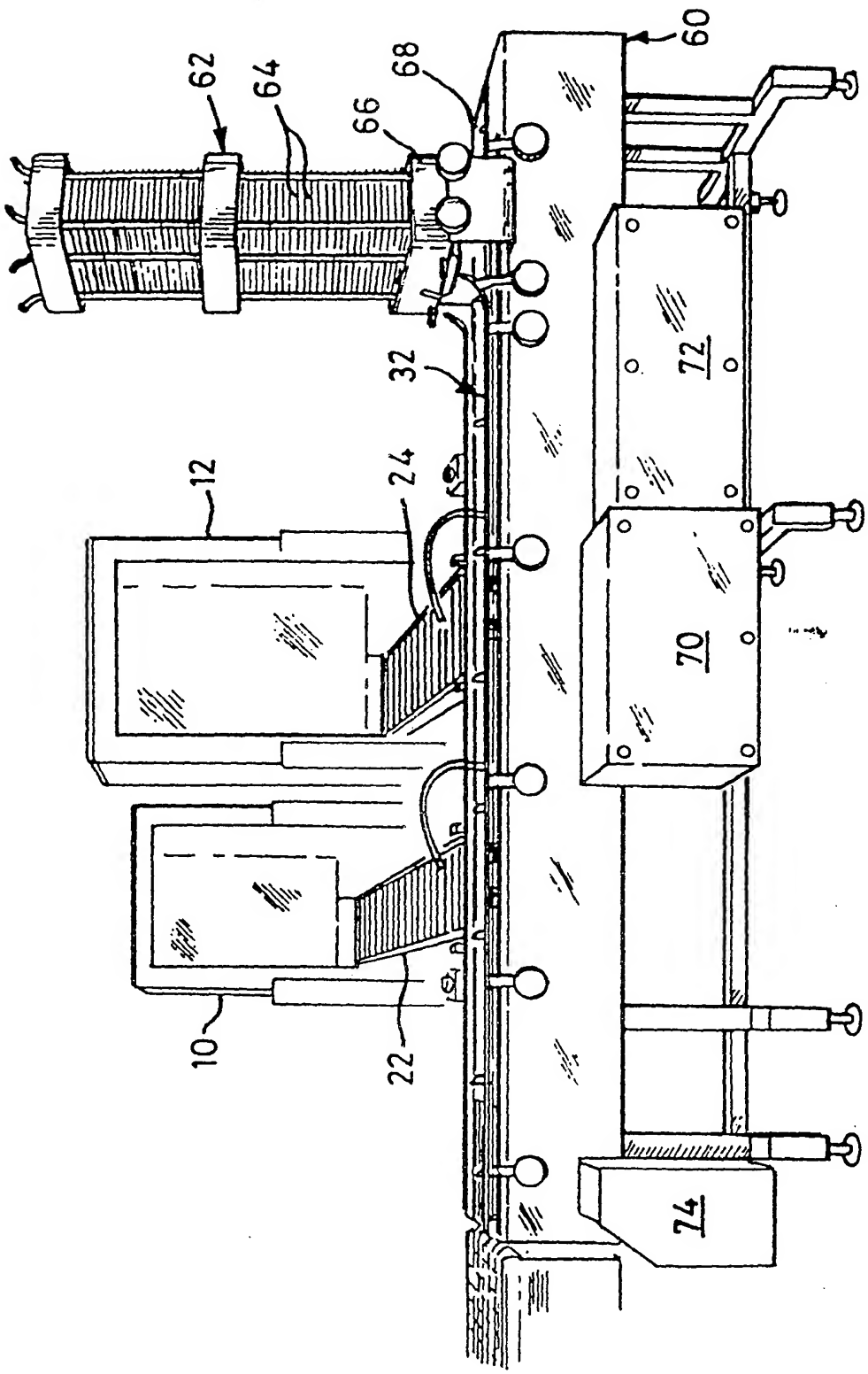

Fig. 2

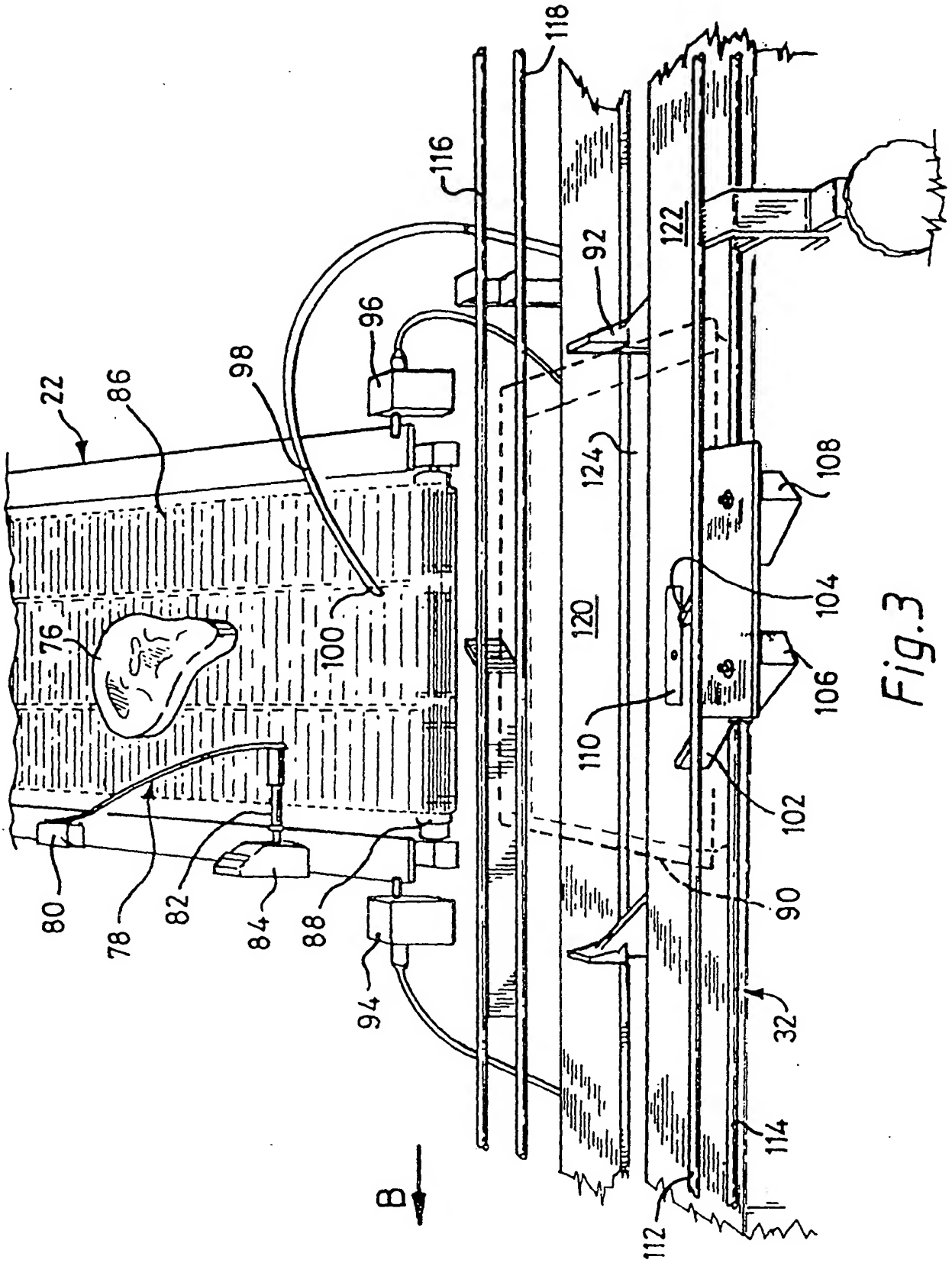
22
86
98
96
118
116
92
122
124
108
104
120
100
76
106
110
102
80
78
82
84
88
90
94
32
114
112
B

Fig.3

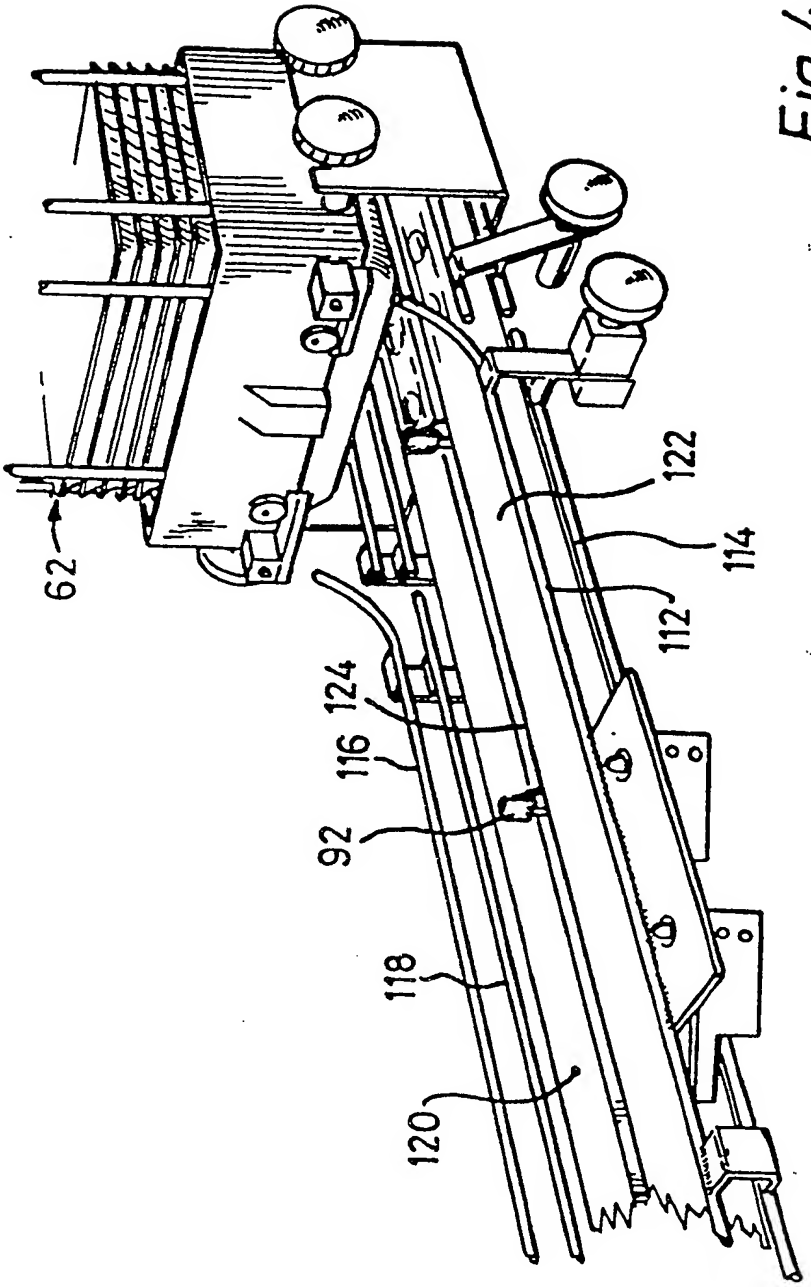

Fig.4

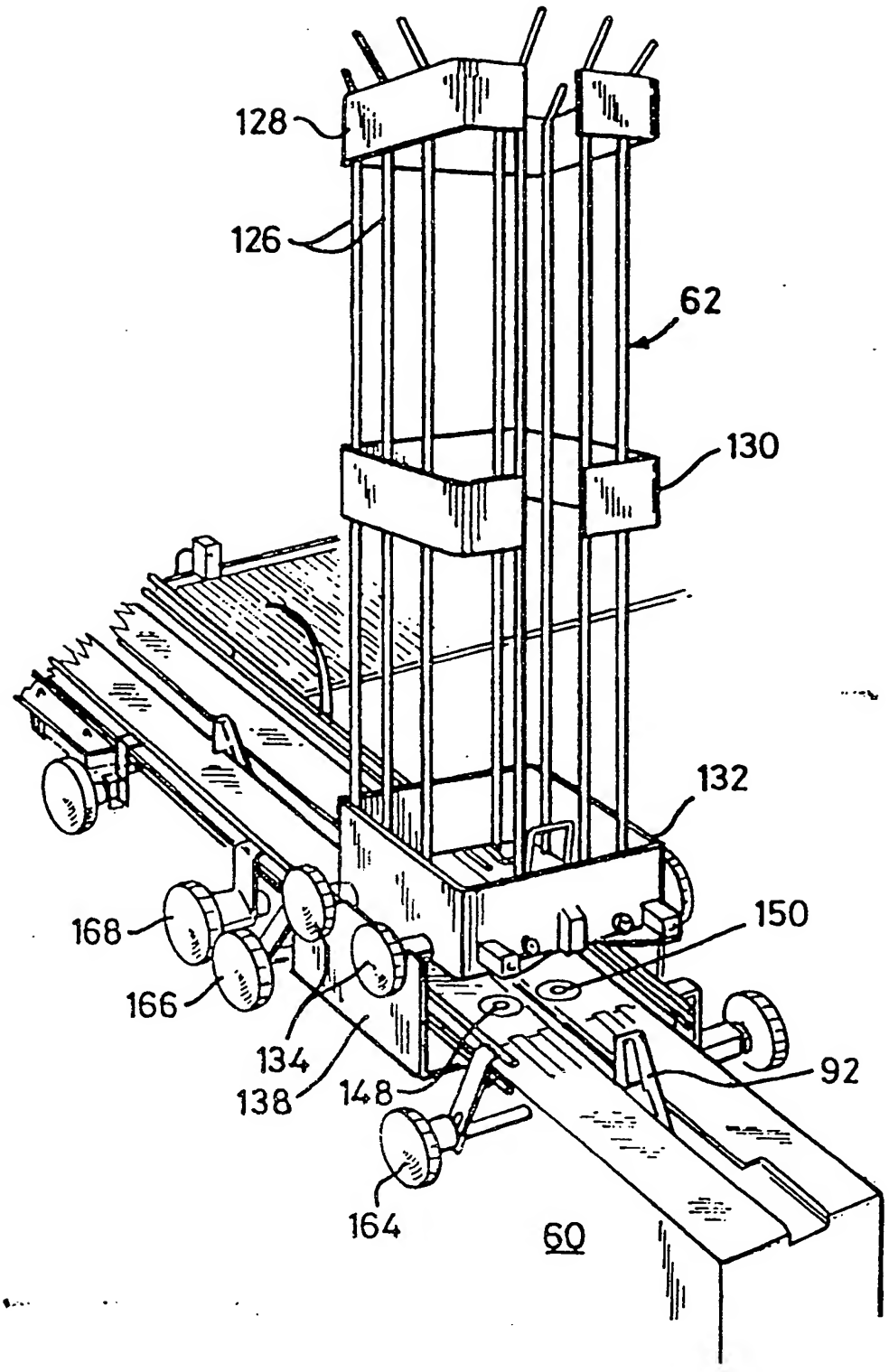

Fig.5

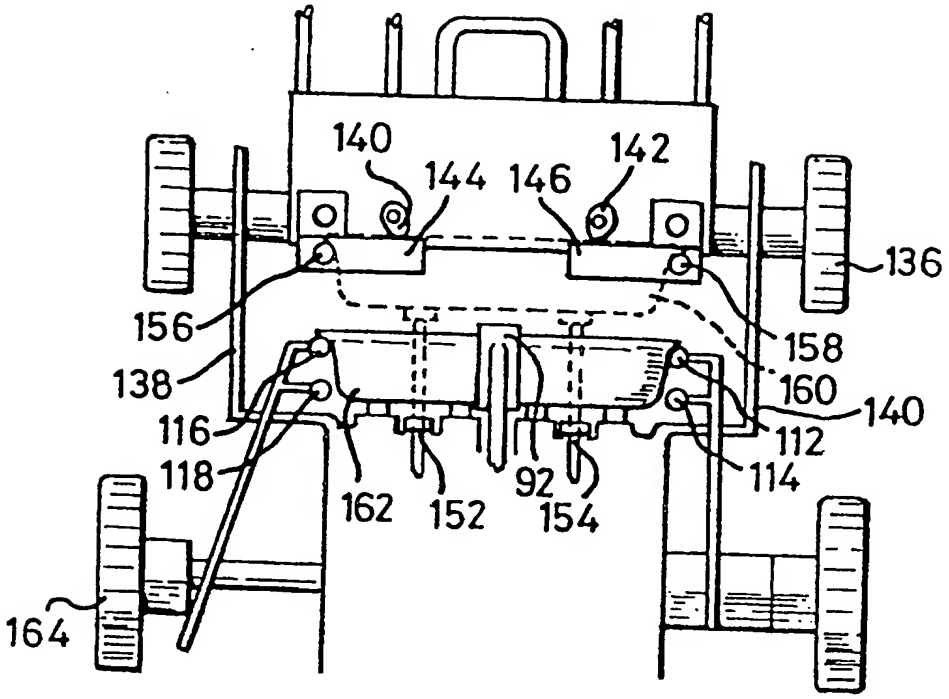

Fig.6

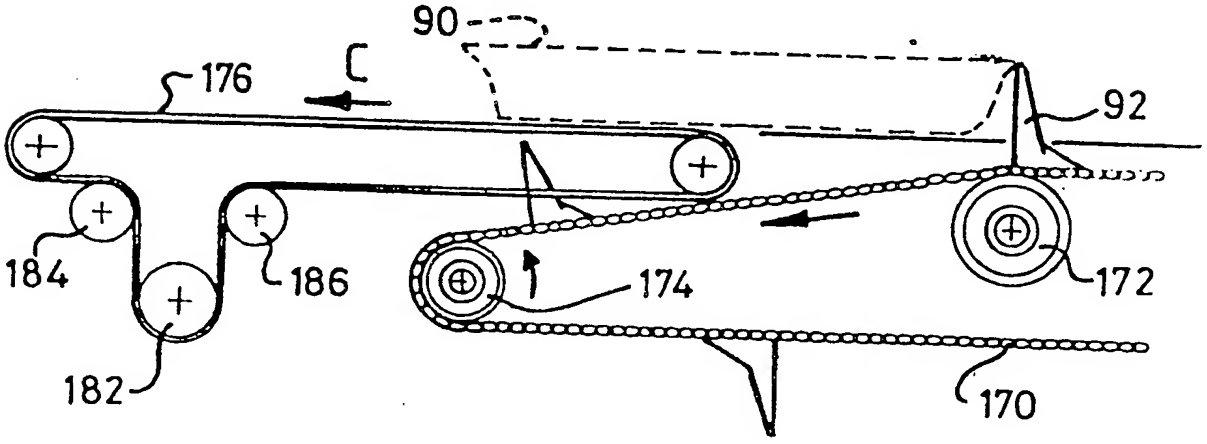

Fig.7a

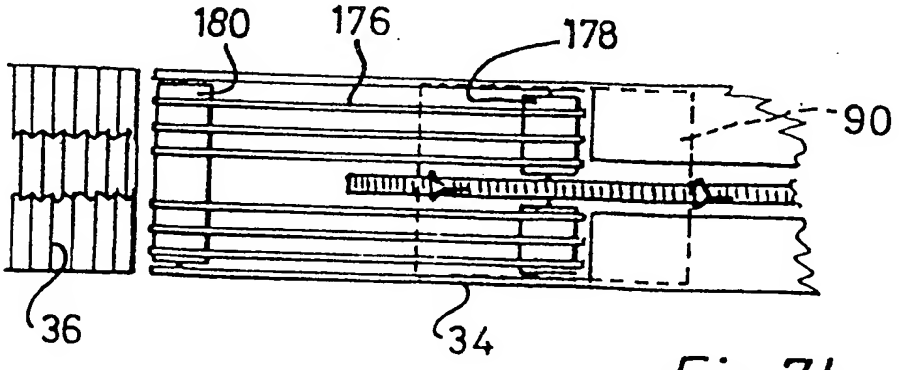

Fig.7b

Fig.9

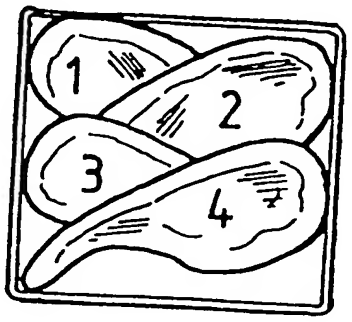

Fig.8

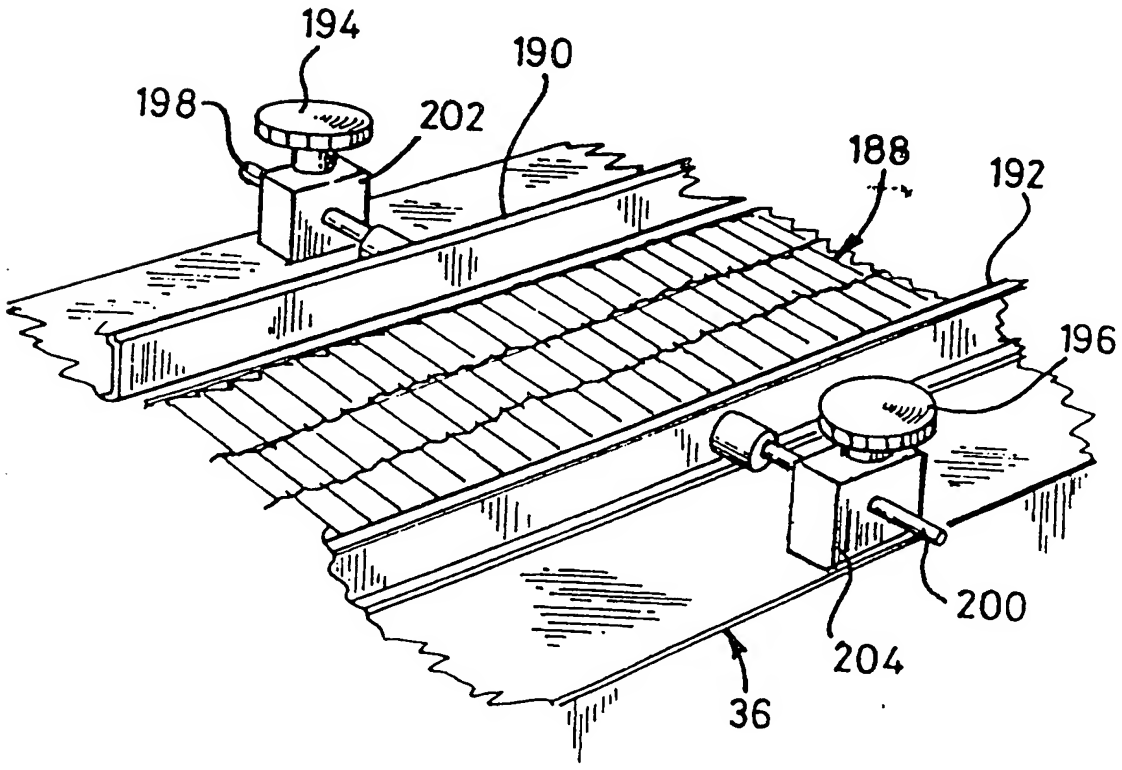

Fig.10

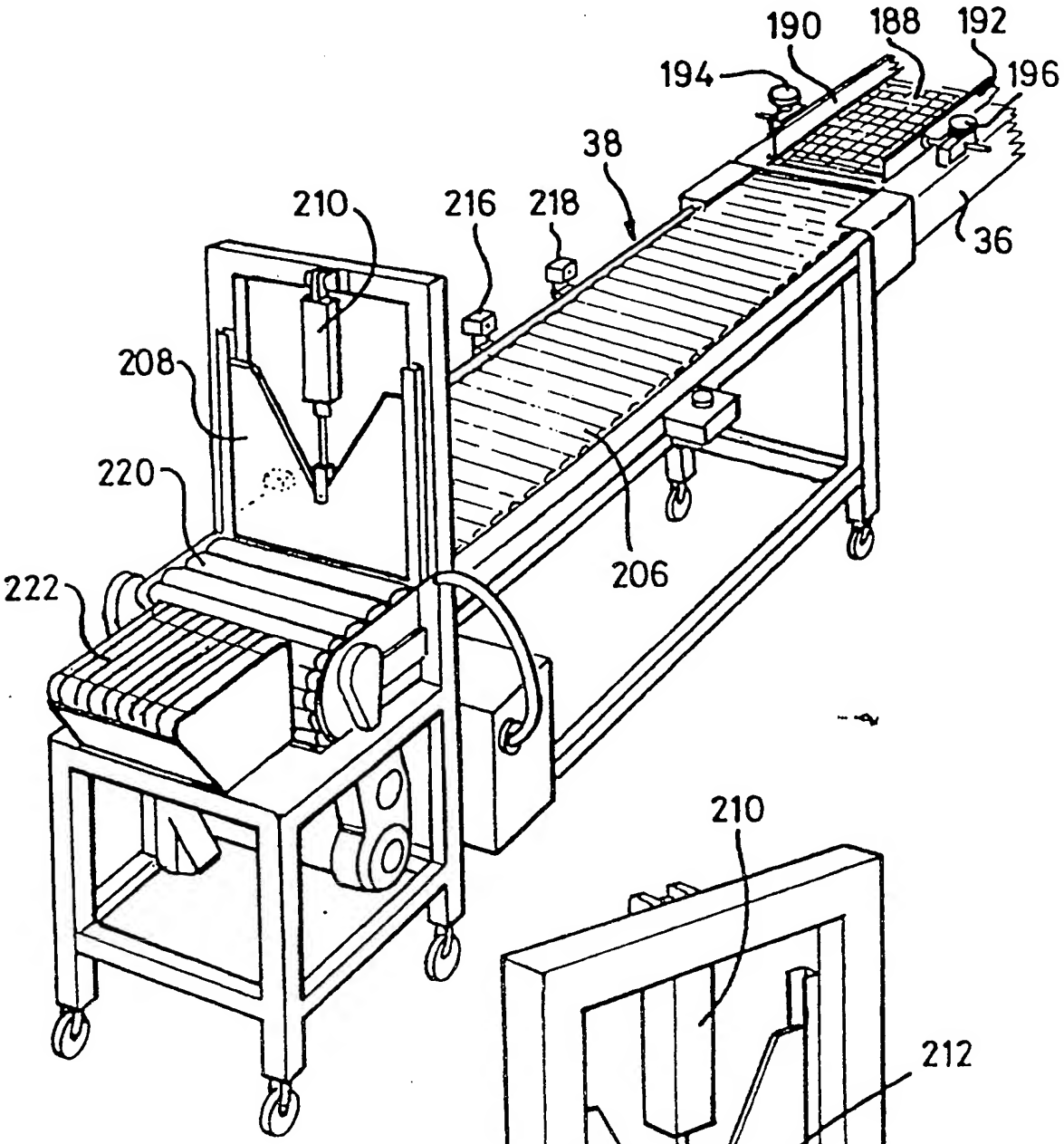
190
188
192
194
196
38
210
216
218
36
208
220
206
222

Fig.11

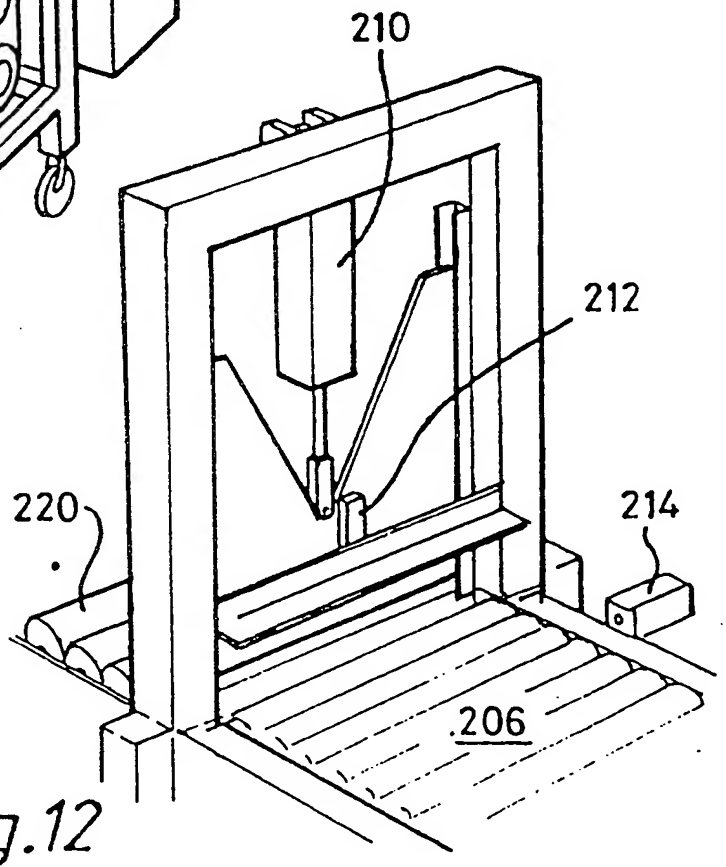
210
212
220
214
206

Fig.12

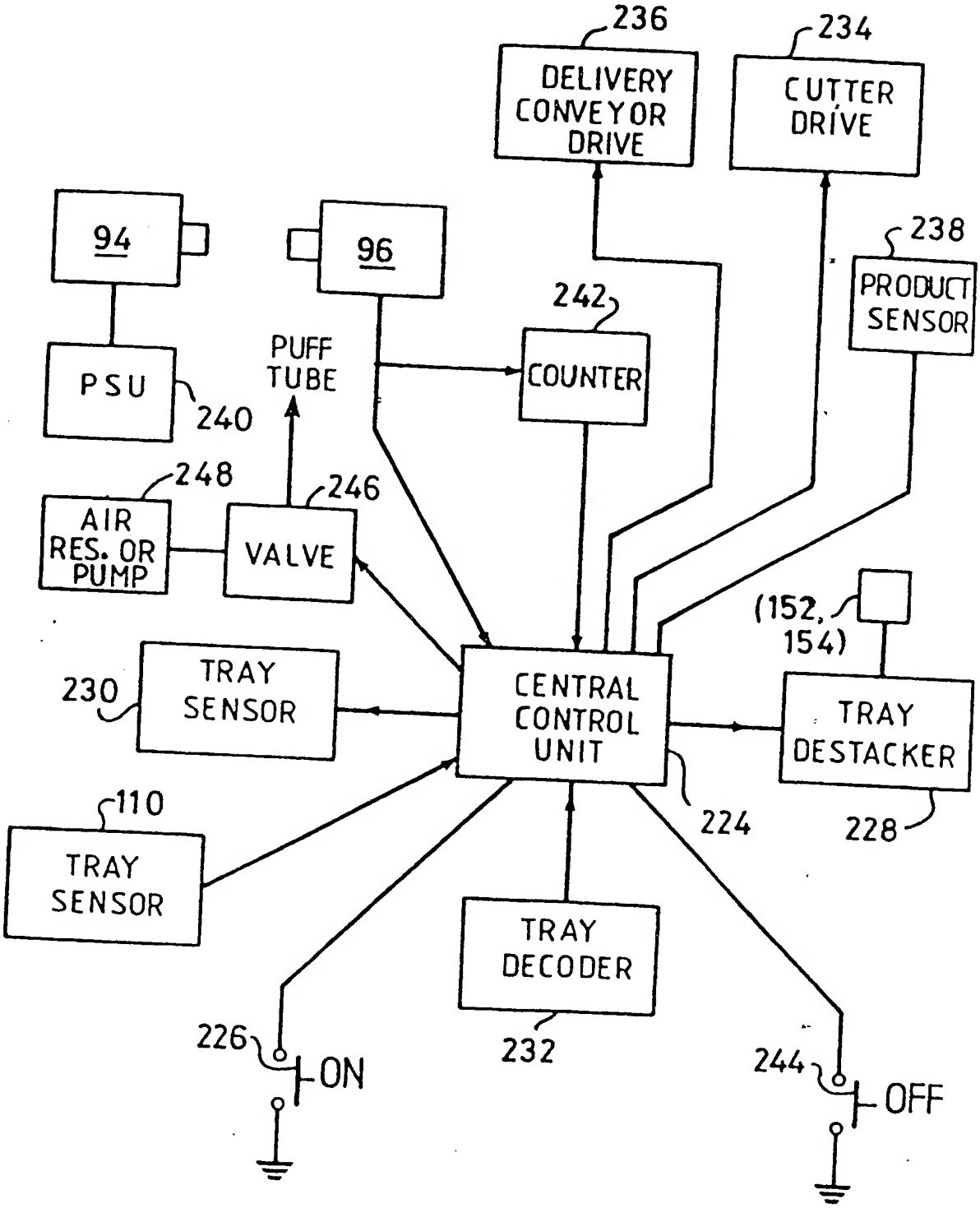
236
DELIVERY CONVEYOR DRIVE
234
CUTTER DRIVE
94
96
238
PRODUCT SENSOR
242
PUFF TUBE
COUNTER
PSU
240
248
246
AIR RES. OR PUMP
VALVE
(152, 154)
230
TRAY SENSOR
CENTRAL CONTROL UNIT
TRAY DESTACKER
110
224
228
TRAY SENSOR
TRAY DECODER
226
ON
232
244
OFF

Fig. 13